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Soil-biofilters for elimination of xenobiotics from wastewaters

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INTRODUCTION

Soil filters are currently discussed for usage in two applications

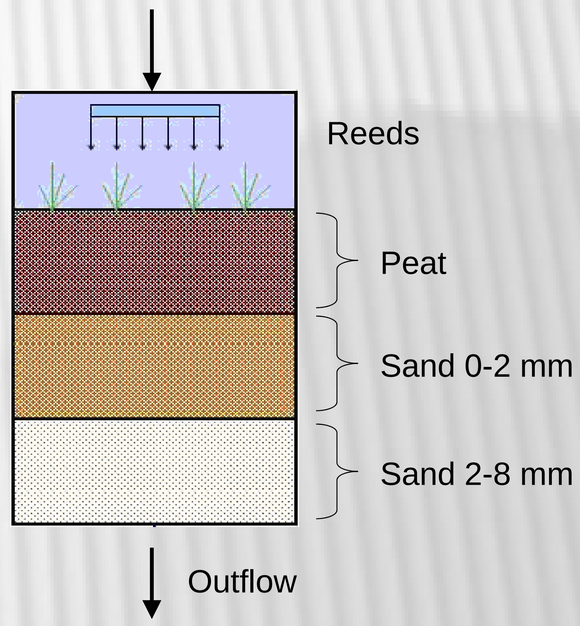
1) Stormwater management
Stormwater (runoff water) is sometimes contaminated by PAH from traffic, biocides from facade runoff, plasticisers from building materials, UV filters from building materials etc. These waters should be treated before discharge or infiltration

2) Polishing treated waste water for persistent organic compounds
Current waste water treatment is not able to remove all persistent organic compounds (xenobiotics). Thus further treatment is needed. For small waste water treatment plants, highly efficient technologies with little maintenance is preferred against technological solutions that need support, like ozonisation or nanofiltration

METHODS

Lysimeter
To study the efficiency and the mechanisms that are important in improved soil filters a lysimeter was used.

Waste water polishing
Conditions with low hydraulic load (61 L/m²/d) was used to mimic waste water treatment

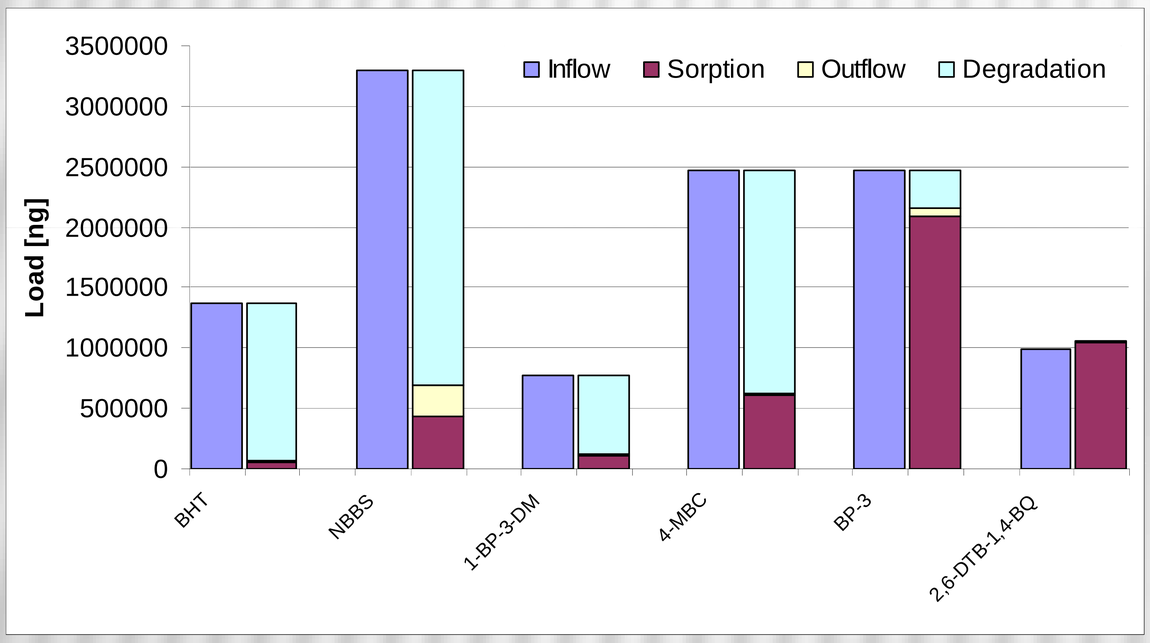


Compounds
(UV Blockers, antioxidants,lubricants)

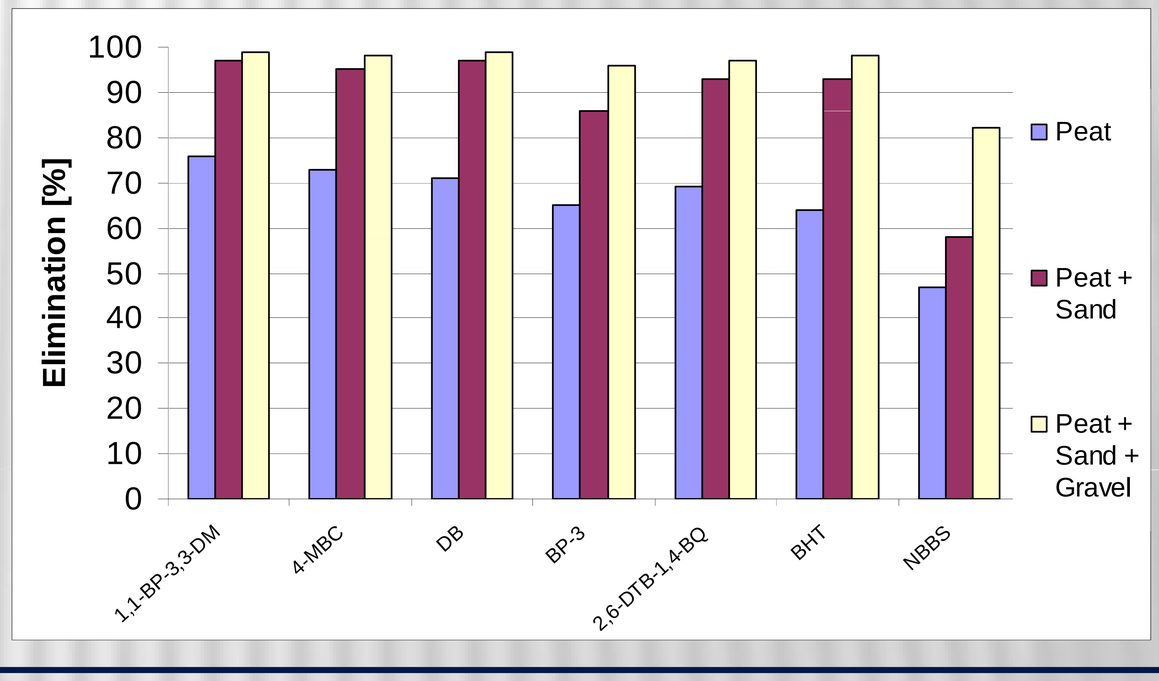
	Acronyms	log Kow
N-butylbenzene sulfonamide	NBBS	2.57
Benzophenone-3	BP-3	3.53
2,6-di-tert-butyl-1,4-benzoquinone	2,6-DTB-1,4-BQ	3.90
Dibenzyl	DB	4.70
1,1-Biphenyl-3,3-dimethyl	1-BP-3-DM	4.90
4-methylbenzylidene camphor	4-MBC	4.95
Butylated hydroxytoluene	BHT	5.03

RESULTS AND DISCUSSIONS

From the balancing experiment it can be seen, that for BHT, NBBS, 1-BP-3-DM, 4-MBC Degradation predominates against sorption, while sorption is more dominant for BP-3, and 2,6-DTB-1,4-BQ



To assess, which layer is most important to eliminate the respective compounds, the soil biofilter was sampled separately for each layer. The peat layer is responsible for 50%-80% of the elimination, but the fine sand layer (0-2 mm) also contributed.



CONCLUSIONS

Soil filters for the elimination of organic micro-pollutants should be constructed with a porous layer rich in organic material such as peat to gain optimal elimination.
The elimination even for very lipohilic compounds is mostly due to degradation, thus the time for usage of the materials is very high.

REFERENCE

Kai Bester and Daniel Schäfer: Activated soil filters (biofilters) for the elimination of xenobiotic compounds (micro-pollutants) from storm- and waste waters, Water Research, 43, 2639-2646, 2009